Mechanical and Aerospace Engineering Seminar

Dr. Michael Lee
Configuration Aerodynamics Branch at NASA Langley Research Center

Will present a talk titled:

The Right Needle from the Right Haystack: Seeking a priori Confidence in Fluid Reduced-order Modeling

Abstract: Reduced-order models (ROMs) enable low-cost, high-fidelity dynamical simulations of chaotic, multiscale, high-dimensional systems like nonlinear fluid flows. However, for every successful low-dimensional simulation there are countless functionally useless ROMs; the challenge falls to selecting the correct modal basis upon which the ROM is founded. The proper orthogonal decomposition (POD) is a historically accepted modal basis construction technique, but selecting the correct POD modes remains the challenge. A new method to select these modes for any fluid flow regime will be presented which yields reliable, low-dimensional bases for reduced-order modeling. The approach is inspired by the invariant flow characteristics identified from fundamental turbulence theory, though the approach remains empirical in nature. A priori basis dimension bounds will be identified. Applications of this work and future avenues of research will be explored in light of recent work published by other authors.

Date: February 11, 2022
Time: 11:00 am
Location: CAMP 176

ZOOM Link for virtual attendance
https://clarkson.zoom.us/j/94333678632?pwd=b25DRlY3STRkak9iNGFmMUY1UjNPZz09
Meeting ID: 943 3367 8632
Passcode: 743721
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A 2016 graduate of Clarkson University and a 2017 and 2020 graduate of Duke University, Dr. Michael Lee's research spans applied aerodynamics, fluid physics, and data fusion. In his current role in the Configuration Aerodynamics branch at NASA Langley Research Center, Lee performs both design and simulation support for the Space Launch System and fundamental research on the next generation of Earth and Mars landers. His expertise in reduced-order modeling enables the development of new simulation tools and integrated design workflows which reduce the design cost of air- and spacecraft without penalties to safety or uncertainty.